



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/541,159	03/31/2000	Tao Kai Lam	(E30-043)-99-202	3415

7590 03/25/2004

GEORGE A. HERBSTER  
HARBORS POINT  
40 BEACH STREET  
SUITE 303  
MANCHESTER, MA 01944

EXAMINER

CHU, KIM KWOK

ART UNIT	PAPER NUMBER
----------	--------------

2653

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/541,159

Applicant(s)

LAM ET AL.

Examiner

Kim-Kwok CHU

Art Unit

2653

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on Amendment filed on 1/22/04 (paper 14).
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 23-28 is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-10 and 19-22 is/are rejected.
- 7) ☒ Claim(s) 7 and 11-18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

***Response to Remarks***

1. Applicant's Remarks filed on January 22, 2004 (paper 14) have been fully considered but they are not persuasive.

(a) Applicant states that the prior art of Satoh or Nakano does not disclose "the generation of a seek time for disk head movement between the first and second addresses by interpolating the array of actual seek times based upon the first and second address" (page 19 of the Remarks, lines 18-21). Accordingly, Satoh teaches the generating of an actual seek time based on the interpolation of seek distance (Fig. 5). Furthermore, Satoh teaches a seek time window which determines the actual time required for moving a disk head between two locations as in Applicant's claim 1; and

(b) Applicant states that the prior art of Satoh or Nakano does not disclose "the division of a physical disk drive into arbitrarily sized segments of a plurality of contiguous track and establishment of an array of actual seek operation between each segment pair based upon the first and second boundaries" (page 19 of the Remarks, lines 12-16). Accordingly, division of a physical disk drive such as sectors, zones and partitions are inherent features when formatting a disk before it can store data. For example, a newly found reference of Fukushima et al. is cited because it explicitly teaches a disk which is divided into volumes and zones etc. As

shown by Figure 5 of Satoh, there will be an array of actual seek times between each segment pair based upon the first and second boundaries.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

*(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.*

3. Claims 1-6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh (U.S. Patent 5,696,646) in view Fukushima et al. (U.S. Patent 5,111,444).

Satoh teaches a method of calculating a seek time very similar to that of the present invention. For example, Satoh teaches the following:

(a) as in claim 1, moving a disk head between first and second boundaries/addresses of a plurality of contiguous tracks on a physical disk drive (Fig. 6; step 1; column 2, lines 37-40);

(b) as in claim 1, establishing an array of actual seek times for seek operations between each segment pair based upon the first and second boundaries (Fig. 7; table 86 stores seek times; actual seek time is the seek time needed for accessing a target address);

(c) as in claim 1, generating a seek time for disk head movement between the first and second boundaries/addresses by interpolating the array of actual seek times based upon the first and second addresses (Figs. 4 and 7; step 84 generates seek time by interpolating; column 6, lines 55-58, column 9, lines 25-41);

(d) as in claim 3, the segment boundaries and first and second addresses are independent of each other and wherein the seek time generation uses the first and second addresses as reference locations in each of the logical blocks (Fig. 3; column 5, lines 61-67);

(e) as in claim 5, the seek time generation includes the step of generating a linear interpolation based upon the location of the first and second addresses relative to the segment boundaries (Fig. 5);

(f) as in claim 6, the linear interpolation is based upon ratio analysis (Fig. 5; column 7, lines 6-20, equation 2); and

(g) as in claim 8, the physical disk drive includes a data block and the interpolation uses the boundaries of the

data block to obtain a disk seek time for seek operations within the data block (Fig. 5; boundaries of the data block is defined by the addresses).

However, Satoh not teaches the following:

(a) as in claim 1, dividing the disk into a plurality of segments, each segment having a given size and being defined by first and second boundaries of a plurality of contiguous tracks;

(b) as in claim 2, the segment division includes dividing the physical disk drive into segments of equal size; and

(c) as in claim 4, each reference (address) is given relative to a predetermined position on the physical disk drive.

Fukushima teaches a data storage system having above features. For example, Fukushima teaches the following:

(a) dividing the disk into a plurality of segments (volumes, sectors etc.), each segment having a given size and being defined by first and second boundaries of a plurality of contiguous tracks (Fig. 1);

(b) the segment division includes dividing the physical disk drive into segments of equal size (Fig. 1; zones are equal size); and

(c) each reference (address) is given relative to a predetermined position on the physical disk drive (Fig. 1).

An information storage medium should be partitioned first so that addresses can be created accordingly for data allocation. Although Satoh's disk system does not disclose that the disk are divided into a plurality of volumes, zones or sectors each with equal size and reference addresses, however, for the advantage of grouping information, it would have been obvious to one of ordinary skill in the art at the time of invention to divided Satoh's disk into segments each with equal size and reference addresses such as Fukushima's volume and zones, because information which is managed under sectors can be searched and addressed more effectively.

4. Claims 9, 10 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh (U.S. Patent 5,696,646) in view of Fukushima et al (U.S. Patent 5,111,444).

Satoh teaches a method for determining the seek time for a physical disk very similar to that of the prevent invention. For example, Satoh teaches the following:

(a) as in claim 9, determining actual seek times for seek operations between the segments (Fig. 7; table 86 stores actual seek times),

(b) as in claim 9, accumulating statistics for each access to each logical volume during the time interval (Fig. 7; table 86 stores seek times statistics),

(c) as in claim 9, converting the accumulated statistics into an estimated number of seeks between each pair of logical volumes (Fig. 5, interpolation);

(d) as in claim 9, defining a seek time for each logical volume pair based upon the segment actual seek times (Figs. 4 and 7; step 84 generates seek time by interpolating; column 6, lines 55-58, column 9, lines 25-41);

(e) as in claim 9, generating a total seek time as the sum of the products, for each logical volume pair, of the actual seek time for and the estimated number of seeks between each logical volume in the logical volume pair over the time interval (Fig. 5; interpolation);

(f) as in claim 10, assigning a predetermined seek time for each seek operation between two segment boundaries (Fig. 5, the two boundaries are A and B);

(g) as in claim 10, calculating an intrasegment seek time based upon the predetermined seek times (Fig. 5; interpolation calculation between two addresses);

(h) as in claim 19, determining the time for a seek operation within a logical volume (Fig. 5; interpolation);



(i) as in claim 20, determination of intra-volume seek time for a logical volume includes defining the boundaries of the logical volume relative to the segment boundaries and determining the seek time between the logical volume boundaries (Fig. 5; interpolation);

(j) as in claim 21, the definition of intra-volume seek time includes interpolating the seek times determined for seek operations between the segments based upon the logical volume boundary locations (Fig. 5, seek time with interpolation calculation); and

(k) as in claim 22, the definition of seek time includes the step of linearly interpolating the seek times determined for seek operations between the segments based upon the logical volume boundary locations (Fig. 5, seek time with interpolation calculation).

However, Satoh not teaches the following:

(a) as in claim 9, the disk is configured to store data in a plurality of logical volumes over a time interval;

(b) as in claim 9, dividing the physical disk into a plurality of fixed sized segments independently of the logical volume configuration on the physical disk drive; and

(c) as in claim 9, each segment has a plurality of contiguous tracks.

Fukushima teaches a data storage system having above features. For example, Fukushima teaches the following:

- (a) the disk is configured to store data in a plurality of logical volumes over a time interval (Fig. 1);
- (b) dividing the physical disk into a plurality of fixed sized segments independently of the logical volume configuration on the physical disk drive (Fig. 1); and
- (c) each segment has a plurality of contiguous tracks (Fig. 1; each zone contains a plurality of contiguous tracks).

An information storage medium should be partitioned first so that addresses can be created accordingly for data allocation. Although Satoh's disk system does not disclose that the disk are divided into a plurality of volumes, zones or sectors each with equal size and reference addresses, however, for the advantage of grouping information, it would have been obvious to one of ordinary skill in the art at the time of invention to divided Satoh's disk into segments each with equal size and reference addresses such as Fukushima's volume and zones, because information which is managed under sectors can be searched and addressed more effectively

***Allowable Subject Matter***

5. Claims 23-28 are allowable over prior art.

6. Claims 7 and 11-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

As in claim 7, the prior art of record fails to teach or fairly suggest that the physical disk drive includes a plurality of data blocks and the interpolation uses a center location for each data block as the reference location to obtain disk seek times for disk seek operations between different data blocks.

As in claim 11, the prior art of record fails to teach or fairly suggest that the seek time determination includes the step of placing the predetermined seek times in a two-dimensional array with the rows and columns defined by the segment boundaries.

As in claim 12, the prior art of record fails to teach or fairly suggest that the accumulation of statistics includes segregating each access to a logical volume into one of

predetermined classes of accesses and weighting the numbers of accesses in each predetermined class.

As in claim 15, the prior art of record fails to teach or fairly suggest that the definition of seek time comprises determining the seek time between a center location of each of the logical volumes in the logical volume pair.

As in claims 23 and 26, the prior art of record fails to teach or fairly suggest that a step of converting the accumulated statistics into an estimated number of seeks between each pair of logical volumes by weighting the numbers of accesses in each of different predetermined classes.

The features indicated above, in combination with the other elements of the claims, are not anticipated by, nor made obvious over, the prior art of record.

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yasukawa (5,245,595) is pertinent because Yasukawa teaches a seek method having a step of setting a target zone.

9. Any response to this action should be mailed to:

Commissioner of Patents and Trademarks Washington, D.C.  
20231 Or faxed to:

(703) 872-9306 (for formal communications intended for  
entry. Or:

(703) 746-6909, (for informal or draft communications,  
please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park  
II, 2021 Crystal Drive, Arlington. VA., Sixth Floor  
(Receptionist).

Any inquiry of a general nature or relating to the status  
of this application should be directed to the Group  
receptionist whose telephone number is (703) 305-4700.

Any inquiry concerning this communication or earlier  
communications from the examiner should be directed to Kim CHU  
whose telephone number is (703) 305-3032 between 9:30 am to  
6:00 pm, Monday to Friday.

*KK* 3/19/04  
Kim-Kwok CHU  
Examiner AU2653  
March 19, 2004

(703) 305-3032

*William Korzuch*  
WILLIAM KORZUCH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2600